

### Notes on the back story of this document:

This is my original submittal to the *Hewlett-Packard Users' Program Library (USA)* of my **HP-41C** program *Othello* at the request of *HP UPL's* Sandy Canning, who sent me a letter on May 28, 1981 explicitly asking me to submit it to the Corvallis library. I promptly complied with her request, plus I also included an additional *HP-41C* program, my *Chess 5x5*.

When I received a copy of my processed submittal, I noticed that they had changed the name from *Othello* to *Reversi* (for copyright reasons) and also my "3 SINGLE-DENSITY MEMORY MODULES" specification to just "3 MEMORY MODULES" for no obvious reason other than simplicity. Afterwards they also included my program in the *European Library* and to that effect they rewrote my documentation (originally written by me on a mechanical inked-ribbon *Olivetti* typewriter,) using a modern plastic-ribbon electric one, and renumbered my program from 00903C to 11019 *Reversi*.

Besides my original submittal (with the aforementioned changes,) I've also included here the four pages of good-quality *barcode* kindly generated by a member from the Australian *PPC Melbourne Chapter*, to allow for fast, error-free entry of the long program into the calculator using the wand.

*Valentin Albillo, 10-11-2021*

00903C

## PROGRAM SUBMITTAL

☒ New Program☐ Revision to Program

Model No.

☐ 67☐ 97☒ 41C

Program Title

~~OTHELLO~~ REVERSI

No. of Steps/Lines

291

Category No.

821

Category Name

BOARD &amp; TABLE GAMES

Abstract — 50 Word Maximum

THIS PROGRAM ALLOWS YOU TO PLAY A GAME OF OTHELLO AGAINST THE 41C. YOU CAN SELECT WHO MOVES FIRST AND THE OPENING. THE 41C CAN PLAY FOR YOU, EVEN AGAINST ITSELF. IF A PRINTER IS PRESENT, THE BOARD IS PRINTED. GOOD PLAYING LEVEL & QUITE FAST. 3 RAMS NEEDED.

Necessary Accessories:

3 ~~RAMS~~ MEMORY MODULES. OPTIONALLY, A PRINTER

Name

VALENTIN ALBILLO

Company

Address

PADRE RUBIO, 61 - 2ºC

City

MADRID 29

State/Country

SPAIN

Zip Code

Phone Number ( )

If my program is accepted, my bonus choice is: ( Please select two programs if your program is a revision. )

Acceptance Choice: ☐ FOUR PROGRAMS, ☒ CREDIT FOR FOUR PROGRAMS\*, OR TWO PROGRAMS AND 10 BLANK CARDS.

\* No partial credit will be given. Select all four programs at the same time.

Submittal Checklist:

Please use the checklist below to insure submittal of all proper program documentation.

☒ Program Submittal☒ Program Description II☒ Program Listing(s)☒ Registers, Status ...☒ Program Description I☒ User Instructions☒ Magnetic Card(s)☒ Keyboard, Card Labeling (optional)

## ACKNOWLEDGMENT AND AGREEMENT

To the best of my knowledge, I have the right to contribute this program material without breaching any obligation concerning nondisclosure of proprietary or confidential information of other persons or organizations. I am contributing this program material on a nonconfidential nonobligatory basis to Hewlett-Packard Company ("HP") for inclusion in its program library, and I agree that HP may use, duplicate, modify, publish, and sell the program material, and authorize others to do so without obligation or liability of any kind. HP may publish my name and address, as the contributor, to facilitate user inquiries pertaining to this program material.

Signature

Date

9-VI-81

# PROGRAM SUBMITTAL

☒ New Program

☐ Revision to Program

Model No.

☐ 67

☐ 97

☒ 41C

Program Title

O T H E L L O

No. of Steps/Lines

2 9 1

Category No.

8 2 1

Category Name

B O A R D & T A B L E G A M E S

Abstract — 50 Word Maximum

THIS PROGRAM ALLOWS YOU TO PLAY A GAME OF OTHELLO AGAINST THE 41C. YOU CAN SELECT WHO MOVES FIRST AND THE OPENING. THE 41C CAN PLAY FOR YOU, EVEN AGAINST ITSELF. IF A PRINTER IS PRESENT, THE BOARD IS PRINTED. GOOD PLAYING LEVEL & QUITE FAST. 3 RAMS NEEDED.

Necessary Accessories: 3 SINGLE DENSITY MEMORY MODULES. OPTIONALLY, A PRINTER

Name

VALENTIN ALBILLO

Company

Address

PAIRE RUBIO, 61 - 290

City

MADRID 29

State/Country

SPAIN

Zip Code

Phone Number ( )

If my program is accepted, my bonus choice is: ( Please select two programs if your program is a revision. )

Acceptance Choice: ☐ FOUR PROGRAMS, ☒ CREDIT FOR FOUR PROGRAMS\*, OR TWO PROGRAMS AND 10 BLANK CARDS.

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Signature

Date

9-VI-81

# PROGRAM DESCRIPTION I

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Program Title OTHELLO

Contributor's Name VALENTIN ALBILLO

Address PADRE RUBIO, 61 - 20C

City MADRID 29 State/Country SPAIN Zip Code \_\_\_\_\_

Program Description, Equations, Variables This program allows the user to play a game of Othello (also known as Reversi, Samurai, etc) against a 41c. The present - program includes all features required: plays quite well, and will easily defeat a beginner, so it provides a challenging level for everyone. The program itself is printer-compatible: runs the same with or without a printer, but if one is present, it will print the board.

YOU PLAY 57  
FLIP 2 PCES

1 2 3 4 5 6 7 8	
1 - - - - -	
2 - - - - -	
3 O O O - - - -	
4 - - O O O - - -	
5 - - O X X X X -	
6 - - O O O X X O	
7 - - - - O X X -	
8 - - - - - O X O	

The program is also autonomous: no data cards required, no card reader needed. It is also quite fast for such a complex - game: the 41c performs some 30 moves (a whole game) in 25 minutes. Besides, the running speed increases as the game goes on.

You can select who makes the first move, - and the type of the opening: either diagonal or parallel. Also , you may select to print the board after every new position, or - only after HP moves (so saving paper and time). The machine recognizes and rejects illegal moves. Can play a single move for you against itself. Even a whole game against itself if you want (imagine, the 41c playing both black and white at the same time !).

Though you are supposed to know the rules of the game, a brief explanation will be given, for the sake of completeness. Here is a brief outline of the rules:

Necessary Accessories 3 single-density memory modules (or a quad module)

Operating Limits and Warnings -your move must be of the form xy, with both x and y ranging from 1 to 8, limits included, and the two exceptions to this rule being 0 (no move) and -1 (HP plays for you). Any negative number may be used instead of -1, if desired. The game generally ends when the board is full of pieces, but it may also end if no player can make a legal move. In that unlikely case, the counting of the pieces is not automatically performed. You must do it by yourself.

Reference(s) New Mathematical Diversions , by Martin Gardner. Includes the rules of Reversi (Othello), and some other curiosities. You can also have a look at the Games Pac for the HP-85 computer, which includes a program to play Reversi (Othello) (not related to this program in any way, to be sure !!!)

This program has been verified only with respect to the numerical example given in Program Description II. User accepts and uses this program material AT HIS OWN RISK, in reliance solely upon his own inspection of the program material and without reliance upon any representation or description concerning the program material.

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Othello is played in an 8x8 board. There are two standard openings (see illustrations):

- diagonal opening (left)
- parallel opening (right)

	1	2	3	4	5	6	7	8
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
4	-	-	-	W	O	-	-	-
5	-	-	-	O	W	-	-	-
6	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-

	1	2	3	4	5	6	7	8
1	-	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-	-
4	-	-	-	O	O	-	-	-
5	-	-	-	W	W	-	-	-
6	-	-	-	-	-	-	-	-
7	-	-	-	-	-	-	-	-
8	-	-	-	-	-	-	-	-

One of the players plays the white pieces (represented by the O), the other the black ones (represented by the checkerboard character).

To make a move, the player places one of his pieces in an empty location (represented by a dash) taking into account that:

- it must be adjacent to a piece of the other player.
- at least one enemy piece must be enclosed between -

the just placed piece and another piece of the same colour. This is, any number of pieces enclosed between the played piece and another one of the same colour are flipped: they become of the capturer's colour. No empty locations can be enclosed, only full rows of enemy pieces can be flipped. The row can be placed in any direction: horizontal, vertical or diagonal. If more than one row is enclosed at the same time, all are flipped. You can capture only when putting a piece on the board: enemy pieces which are left enclosed by yours because of other factors are not captured, of course.

	1	2	3	4	5	6	7	8
1	O	W	W	-	W	W	W	O
2	O	O	O	O	O	O	O	O
3	O	O	O	W	O	O	O	O
4	W	W	O	W	O	O	W	O
5	W	W	O	O	W	O	W	O
6	W	O	-	O	O	O	O	W
7	W	O	O	O	O	O	O	O
8	O	O	O	O	O	O	O	O

Some example should make it clear. Look at the diagonal opening: if black plays to 64 (6 vertical, 4 horizontal), then the white piece at 54 is between the 2 black pieces at 44 and 64 (just played), so it's flipped: the white piece at 54 becomes black. (By the way, you play black, HP plays white).

Now, look at the illustration at the left of these lines: if white plays at 14, the black pieces at 12, 13, are enclosed between the just played piece at 14 and the white piece at 11, so they would be flipped. Simultaneously, the black pieces at 15, 16

and 17 are between the same just played piece at 14 and the white piece at 18, so they would be flipped, too.

On the other hand, in the same board position, if black plays at 63 it would flip the white pieces at 62, 53, 43, 33, 23, 64, 65, 66, 67, because there is another black piece at the end of each row of white pieces, and none of the rows contains empty locations between pieces.

### PROGRAM CHARACTERISTICS

The program is exactly 672 bytes (96 registers) long, so it exactly fits onto 3 magnetic cards. The program is optimized for running speed: each location on the board is stored onto a single data register, so a minimum SIZE 117 is required. This makes necessary to have at least 3 single-density memory modules attached, in order to run the program, leaving a port free to plug in the card reader or the printer.

Registers are used as follows: R00 thru R07 are scratch. R08 thru R15 contain the directions array, necessary to scan each row. R16 thru R27 store an array of constants used by the strategic part of the program to compute each move. R17 thru R16 store the 8x8 board, including edges (thus being actually a 10x10 board). As you may see, the constants array and the board overlap, so saving 11 registers. This is possible because the edges may be any number except +1 or -1, and none of the constants have those values. White (HP's) pieces are stored as +1, black (yours) ones as -1, and empty locations are 0. The edges are typically 0, but can be any number except +1 or -1.

The program uses flags 1, 2, 3, 4. If flag 3 is set, your move is being tested for legality, or HP is playing your pieces against its own. If flag 4 is set, a given number is not yet considered legal. If flag 1 is set, HP plays your pieces for you and finally, if flag 2 is set and the printer is present, the board will not be printed after your moves (except, of course, if you make the last move). If flag 2 is clear, the board is printed after every move. All flags are controlled by the program, except flag 2 which is user-dependent: you may set or clear it from keyboard as often as you like.

Remember that the program is printer-compatible: if you do not use a printer, it runs the same, except that the board is not printed, of course.

TIPS AND REMARKS

a) Here are a few typical running times. These times are just the time needed to compute HP moves. They do not include time required to print the board, but, of course, they do not include the time required for you to think your own move.

-an average game: 30 HP moves

-without printer : 25 minutes  
 -printer, SF 02 (1 board) : 60 minutes  
 -printer, CF 02 (2 id. ) : 75 minutes

as you may see from these figures, the printer slows down significantly the execution speed, but the convenience of the automatic handling of the board, and the fact that an actual board is not needed at all, together with the game being recorded on the paper tape, make it worth the price.

- Remember also that execution gets faster as the program progresses, from some 70 seconds for a move near the beginning of the game, to a few seconds for a move near the end of the game. This is possible because HP keeps track of already occupied locations, and once a group of 5 locations is tested to be all of them occupied, they are not tested anymore, speeding up the search algorithm quite a lot when the game is close to its termination.

b) No moves are random, so the same game is played if you make exactly the same moves. This feature is useful: if you made a mistake that allowed HP to win, you can repeat that game once more, this time avoiding the error, to see who wins now. As you'll see, the level of play is quite good for such a tiny program running under the speed limitations of the 41c. Any improvements to the playing logic are welcome, however.

c) There are several ways of making room for improvements, or to fit the program into 2 RAMs (instead of 3). Possible shortcuts are:

- (1) delete lines 68,69, change LBL"OTHELLO" to LBL"O", line 260 to "CK", and shorten other alpha comments. This saves 27 to 30 bytes at almost no cost.
- (2) if you have no printer, or do not want printing of the board, you can delete lines 06,62, 195 thru 251, 254 thru 258 (limits always included) and change line 49 to 60 instead of 61. This modification saves 116 bytes.
- (3) you may use a data card: delete lines 07 thru 30 (both included) and insert in their place: 07 16.027

08 RDTAX

This saves another 148 bytes, but a card reader is needed, and you must load a data card when the program asks for one. The data card contains the constants that the program stores (in lines 07 thru 30) in their respective registers. See program listings.

d) Remember that, although the game normally ends when the board is full of pieces, it may also end if no player can make a legal move (or if a player loses all his/its pieces). In these cases, the automatic counting of the pieces to decide the winner is not performed: you'll have to do it manually.

-.o.o.o.o.o.o.o.o.o.-

SF 82  
XEQ "OTHELLO"

DIRC ?

DIN

	1	2	3	4	5	6	7	8
1	—	—	—	—	—	—	—	—
2	—	—	—	—	—	—	—	—
3	—	—	—	—	—	—	—	—
4	—	—	—	⊗	○	—	—	—
5	—	—	—	○	⊗	—	—	—
6	—	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—	—
8	—	—	—	—	—	—	—	—

Page 2

100-443887-100

REF ?

YOU PLAY 64

000000

1 FLOW 63

FLIP 1 PCES

CF 82

76 RIN

... and so on ...

FLMP 1 PCES

1 2 3 4 5 6 7 8

1	-	-	-	-	-	-	-
2	-	-	-	-	-	-	-
3	-	-	-	-	-	-	-
4	-	-	-	⊗	0	-	-
5	-	-	⊗	⊗	0	-	-
6	-	-	0	0	⊗	-	-
7	-	-	-	-	⊗	-	-
8	-	-	-	-	-	-	-

I PLAY 66

FLIP 1 PCE3

1 2 3 4 5 6 7 8

1	-	-	-	-	-	-
2	-	-	-	-	-	-
3	-	-	-	-	-	-
4	-	-	-	⊗	0	-
5	-	-	⊗	⊗	0	-
6	-	-	0	0	0	-
7	-	-	-	-	⊗	-
8	-	-	-	-	-	-

the machine plays to 66, so flipping once more the piece at 65. As you may see, unlike other games, such as chess or checkers, pieces never move from where they are left, but merely change sides any number of times. Of course, the purpose of the game is to have the maximum number of pieces on the board when the game ends.

The board is printed now, showing the effects of the machine move on the position.

(Continuation form)

example continued : in the printout at the left, a typical end of a game

```

 1 2 3 4 5 6 7 8
1 0 x x x x x x 0
2 0 x x x x x x -
3 0 0 0 x 0 0 0
4 x x 0 0 0 x 0
5 x x 0 0 0 0 0
6 x 0 0 0 0 0 0
7 x 0 0 0 0 0 0
8 0 0 0 0 0 0 0

```

```

MOVE ?
-1 RUN
NO MOVE
1 PLAY 28
FLIP 8 PCEs

```

```

 1 2 3 4 5 6 7 8
1 0 x x x x x x 0
2 0 0 0 0 0 0 0
3 0 0 0 x 0 0 0
4 x x 0 0 0 x 0
5 x x 0 0 0 0 0
6 x 0 0 0 0 0 0
7 x 0 0 0 0 0 0
8 0 0 0 0 0 0 0

```

```

GAME IS OVER
HP: 49, YOU: 15
I WON

```

HP has just moved. Then you are prompted for your move. In the position shown, there is just one empty location left. But you cannot place a piece there, because no white pieces would result enclosed between your piece and another of your pieces. So you have no legal move. However, if you are a beginner, you may be unsure about it, so you decide to have the machine select your move (if any) for you:

enter -1, R/S. HP begins to search for a suitable move for you. But as expected, finds none, displays (and beeps; you may have noticed by now that most messages are beeped as well as displayed and printed) NO MOVE, then proceeds to search for its move. Finally, after a few seconds, it moves to 28 (where else ?!) and, while doing so, flips no less than 8 of your pieces: those located at 22,23,24,25,26,27,37 and 46.

The board is printed for the last time. Then the machine realizes that the game has ended, displays GAME IS OVER, and counts both black and white pieces on the board, to decide the winner. This time, it displays HP: 49, YOU: 15, meaning there are 49 white pieces on the board, while you have only 15 of your pieces remaining. Obviously, HP has won, so it displays a final I WON message. Once this message is on the display, there is only one possibility left for you: TRY AGAIN

TEST GAME : if desired, test that your program is correctly loaded by executing the following game.

Diagonal opening, HP first. Only the moves are shown (no flip. pces)

YOU	HP	+	YOU	HP	+	YOU	HP	+	YOU	HP	+	YOU	HP
-	65	+	42	68	+	57	85	+	25	16	+	38	48
46	33	+	75	36	+	83	58	+	26	52	+	78	82
64	63	+	35	84	+	76	41	+	32	47	+	71	87
43	66	+	86	51	+	61	34	+	23	14	+	12	11
72	53	+	31	56	+	62	74	+	15	73	+	-0	21
67	81	+	27	18	+	24	13	+	17	37	+	77	88
												22	28

FINAL SCORE: 17 47, so HP WON

Note : if you play with a printer (and set it to NORM, as recommended), you'll have each machine move printed, as well as displayed. However, if you play without a printer, and you happen to miss the I PLAY xy display, do not worry. Simply, use backarrow to clear the MOVE ? display, and the last HP's move will be in the display, in the form xy. (use back arrow just once. Using it twice or more consecutively would also clear the xy move ! You can also simply turn alpha on and off to clear the MOVE ? prompt from the display.)

-.o.o.o.o.o.o.o.o.o.o.o.o.o.o.o.-

# USER INSTRUCTIONS

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				SIZE: (HP-41C) 117
STEP	INSTRUCTIONS	INPUT	FUNCTION	DISPLAY
1	load the program. You play black. HP white			
2	if you want to use the printer, plug it in now and set NORM position.			
3	if a printer is used and want to suppress board printing after your moves, press:		SF 02	2 annunc. on
	the board will now be printed just after HP moves. This can be done at any moment			
or 3	to print always the board, press		CF 02	2 annunc. off
4	make sure you have SIZE 117 at least,			
5	begin the game, press		XEQ (alpha) OTHELLO (alpha)	DIAG ?
6	if you want to play diagonal opening		R/S	HP 1ST?
or 6	if you want to play parallel opening	N	R/S	HP 1ST?
7	if you want HP to make the first move		R/S	I MOVE
or 7	if you want to make the first move	N	R/S	MOVE?
8	<u>IF IT IS YOUR TURN</u> (MOVE? on the display)			
9	-enter your move: (x=vertical,y=horizont)  (your move is tested for legality. If it is found to be illegal, you'll be prompted once more for your move with MOVE?. Go to step 9, then)	xy	R/S	YOU PLAY xy FLIP p PCES or ILLEGAL MOVE?
or 9	-you have no legal move: enter	ø	R/S	
	and HP proceeds to compute its move			
or 9	-you want the machine to play your own pieces against its own in this turn: and HP computes your move, displays:	-1	R/S	
	and then, automatically, computes its own move. NO MOVE is displayed if the machine finds no legal move for your pieces. If you want a whole machine/machine game, enter always -1 as your move.			YOU PLAY xy FLIP p PCES or NO MOVE
10	<u>IF HP MOVES</u> it will think its move for a while, then display : xy is the location where HP puts its piece and p is the number of your pieces flipped. NO MOVE is displayed if no legal move is possible for HP. You then have the turn once more: go to step 8			I PLAY xy FLIP p PCES or NO MOVE  then MOVE?
	(continues on next page)			

<u>STEP</u>	<u>INSTRUCTIONS</u>	<u>INPUT</u>	<u>FUNCTION</u>	<u>DISPLAY</u>
	(if you play without a printer, remember to actualize the board after HP moves: put a white piece where indicated, then flip your captured pieces.)			
11	Once the last player makes the last move, you should see:  where nm= number of white(HP) pieces on the board mm= number of black(you) pieces on the board			GAME IS OVER HP: nm, YOU: mm I WON or YOU WON

of course, the player with most pieces at the end of the game wins the game. So, if HP has 24 pieces on the board and you have 40, you won. If HP has 40 and you 24, HP wins. But if both have 32 pieces, it is a tie and no winning message is displayed.

Notes:-if the printer is plugged in, everything that appears in the display is printed as well, and the resulting board position is printed after every legal move if flag 02 is clear, and only after HP moves if it is set. After the last move, the board is printed also, regardless of the status of flag 02.

-You may set or clear flag 02 using SF 02 and CF 02 respectively from the keyboard as often as you like. You may do it at any time during program execution, whenever the machine is at a halt.

-if no player can make a legal move, or if one player loses all his pieces, the game is ended, but this is not recognized by the program and the automatic counting of the pieces is not performed. Do it yourself, to determine the winner. The board, if not already printed, may be forced to be printed by the following series of keystrokes:

(gold) GTO . 202  
R/S

and halt the program just after the 8th row is printed, by pressing R/S. Once the board is printed, you can perform the counting.

-the machine-plays-for-you feature is very useful. You can use it freely whenever you don't know what to play: let the machine play (honestly) your pieces, hoping its election is a good one. Or, if you are unsure whether you have any legal move or not, let the machine play your pieces:  
    - if there is a legal move for you, it will be found  
    - if no legal move at all, NO MOVE is displayed, and the machine now computes its own move.

this capability is specially useful for beginners; also, if you want the machine to play a whole game against itself, always enter -1 as your move, and you'll see HP in action as never before !

# PROGRAM LISTING

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☐ 67 ☐ 97 ☒ 41C

STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS	STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
	01*LBL	"OTH		36	STO 72		
	ELLO"			37	9		
	02 CLRG			38	STO 15		
	03 FIX 0			39	CHS		
	04 CF 29			40	STO 14		
	05 CF 01			41	+		
	06 CF 12			42	STO 11		
	07 .8188111			43	CHS		
883				44	STO 10		
	08 STO 16			45	11		
	09 .8661683			46	STO 13		
138				47	CHS		
	10 STO 17			48	STO 12		
	11 .1316636			49	61		
633				50	STO 07		
	12 STO 18			51	"DIAG ?"		
	13 .3684855			52	CF 23		
158				53	AON		
	14 STO 19			54	PROMPT		
	15 .4148141			55	RCL 09		
564				56	RCL 08		
	16 STO 20			57	FS?C 23		
	17 .6553564			58	X<>Y		
346				59	STO 61		
	18 STO 21			60	X<>Y		
	19 .3435747			61	STO 71		
552				62	XEQ 06		
	20 STO 22			63	"HP 1ST		
	21 .5742472			?"			
425				64	PROMPT		
	22 STO 23			65	AOFF		
	23 .7376626			66	FS?C 23		
732				67	GTO 00		
	24 STO 24			68	"I MOVE"		
	25 .3723268			69	AVIEW		
287				70	SF 29		
	26 STO 25			71*LBL	14		
	27 .7178212			72	"I"		
812				73	CF 03		
	28 STO 26			74*LBL	08		
	29 .1772772			75	16.027		
227				76	FS?C 29		
	30 STO 27			77	21		
	31 SIGN			78	STO 05		
	32 STO 62			79*LBL	11		
	33 STO 09			80	RCL IND		
	34 CHS			05			
	35 STO 08			81	X=0?		



# PROGRAM LISTING

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STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS	STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
82	GTO 05			127	SF 04		
83	SF 05			128	17		
84	LBL 13			129	+		
85	RCL 10			130	STO 00		
86	X↑2			131	RCL IND		
87	*			00			
88	STO 06			132	X=0?		
89	INT			133	RTN		
90	XEQ 12			134	CF 05		
91	FC?C 04			135	STO 01		
92	GTO 00			136	0.015		
93	RCL 06			137	STO 02		
94	FRC			138	RCL 09		
95	X=0?			139	FC? 03		
96	GTO 13			140	CHS		
97	FS? 05			141	STO 04		
98	STO IND			142	LBL 01		
05				143	RCL 00		
99	LBL 05			144	RCL IND		
100	ISG 05			02			
101	GTO 11			145	+		
102	"NO MOVE			146	STO 03		
"				147	RCL IND		
103	AVIEW			X			
104	TONE 9			148	RCL 04		
105	PSE			149	X=Y?		
106	LBL 00			150	GTO 12		
107	FS?C 01			151	LBL 03		
108	GTO 14			152	LASTX		
109	"MOVE ?"			153	ST+ 03		
110	PROMPT			154	RCL IND		
111	X=0?			03			
112	GTO 14			155	RCL 04		
113	SF 03			156	X=Y?		
114	"YOU"			157	GTO 03		
115	X<0?			158	CHS		
116	SF 01			159	X=Y?		
117	X<0?			160	GTO 12		
118	GTO 08			161	STO IND		
119	XEQ 12			00			
120	FC?C 04			162	LBL 04		
121	GTO 14			163	LASTX		
122	"ILLEGAL			164	ST- 03		
"				165	RCL 00		
123	AVIEW			166	RCL 03		
124	TONE 9			167	X=Y?		
125	GTO 00			168	GTO 12		
126	LBL 12			169	RCL 08		

Note: Refer to "HP-41C OWNER'S HANDBOOK AND PROGRAMMING GUIDE" for specific information on keystrokes. The Function Index is found at the very back of the Handbook. Refer to Appendix E in 67 or 97 "OWNER'S HANDBOOK AND PROGRAMMING GUIDE" for exact keystrokes.



# PROGRAM LISTING

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STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS	STEP/ LINE	KEY ENTRY	KEY CODE (67/97 only)	COMMENTS
170	ST*	IND		216	RCL	13	
Y				217	SKPCOL		
171	ST-	01		218	X<>Y		
172	GTO	04		219	ACCHR		
173*	LBL	12		220	ISG	X	
174	ISG	02		221	GTO	02	
175	GTO	01		222	PRBUF		
176	RCL	01		223	28.035		
177	X=0?			224	STO	05	
178	RTH			225*	LBL	09	
179	CF	04		226	RCL	04	
180	"F PLAY			227	ACCHR		
"				228	RCL	15	
181	RCL	00		229	SKPCOL		
182	17			230	SF	12	
183	-			231*	LBL	10	
184	ARCL	X		232	RCL	IND	
185	AVIEW			05			
186	FC?	01		233	RCL	09	
187	FC?	03		234	+		
188	BEEP			235	RCL	IND	
189	PSE			X			
190	"FLIP "			236	ACCHR		
191	ARCL	01		237	RCL	03	
192	"F PCES"			238	SKPCOL		
193	AVIEW			239	ISG	05	
194	PSE			240	GTO	10	
195	FC?	02		241	PRBUF		
196	GTO	06		242	ST+	05	
197	FS?	03		243	CF	12	
198	GTO	12		244	ISG	04	
199*	LBL	06		245	GTO	09	
200	FC?	55		246	ADV		
201	GTO	12		247	FS?	03	
202	ADV			248	GTO	12	
203	31			249	ADV		
204	STO	00		250	ADV		
205	45			251*	LBL	12	
206	STO	01		252	DSE	07	
207	79			253	RTH		
208	STO	02		254	FC?	02	
209	2.01			255	GTO	12	
210	STO	03		256	FS?C	03	
211	8			257	XEQ	06	
212	SKPCOL			258*	LBL	12	
213	49.056			259	32		
214	STO	04		260	"GAME IS		
215*	LBL	02		OVER"			

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# PROGRAM LISTING

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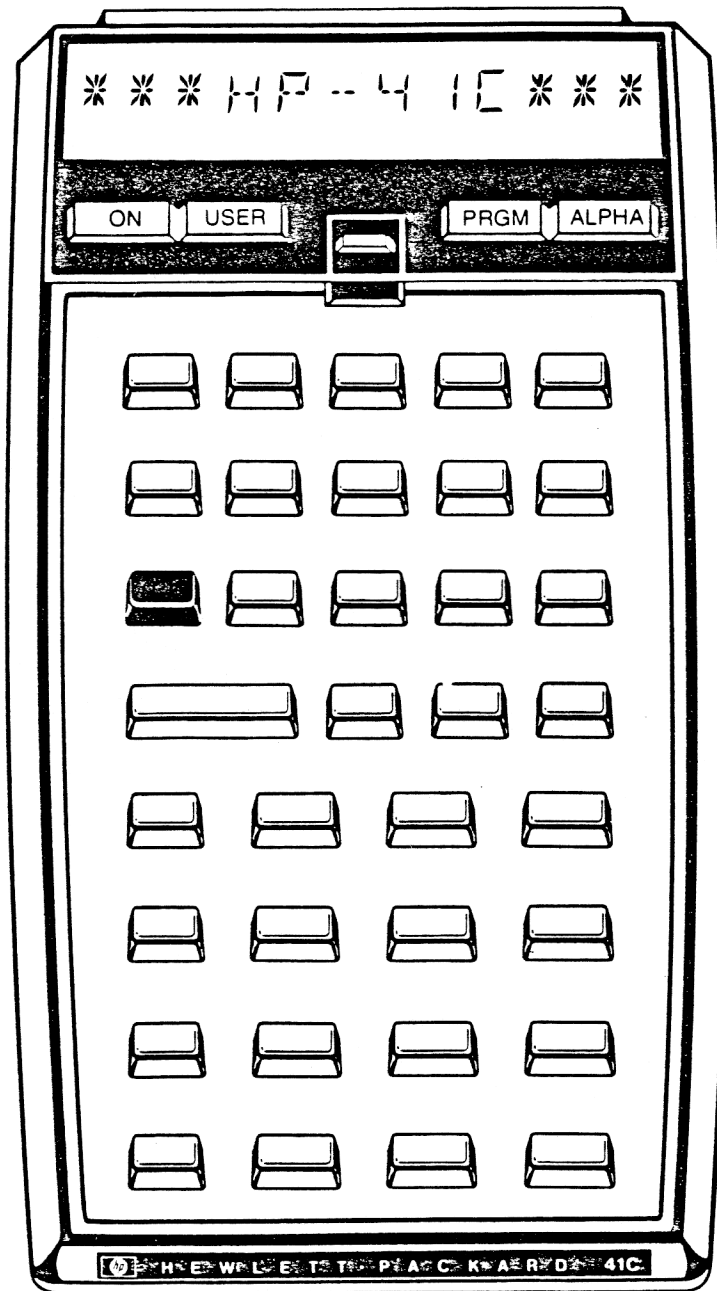
[illegible]

**Note:** Refer to "HP-41C OWNER'S HANDBOOK AND PROGRAMMING GUIDE" for specific information on keystrokes. The Function Index is found at the very back of the Handbook. Refer to Appendix E in 67 or 97 "OWNER'S HANDBOOK AND PROGRAMMING GUIDE" for exact keystrokes.

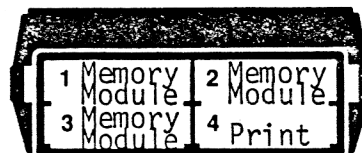
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# KEYBOARD CARD LABELING

KEYBOARD

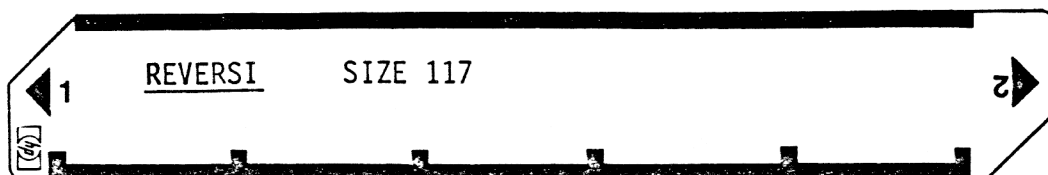


SYSTEM  
CONFIGURATION



(Printer is optional)

CARD



V ALBILLO's 'OTHELLO' SIZE 117 (3 MODULES) 100 REGISTER PROGRAM

ROW 2 2 - 7

ROW 3 7 - 8

ROW 4 8 - 9

ROW 5 9 - 11

ROW 6 11 - 13

ROW 7 13 - 15

ROW 8 15 - 15

ROW 9 16 - 17

ROW 10 17 - 19

ROW 11 19 - 21

ROW 12 21 - 22

ROW 13 23 - 23

ROW 14 24 - 25

ROW 15 25 - 27

ROW 16 27 - 29

ROW 17 29 - 30

ROW 18 30 - 37

ROW 19 38 - 46

ROW 20 47 - 51

ROW 21 51 - 58

ROW 22 59 - 63

ROW 23 63 - 67

ROW 24 67 - 70

ROW 25 71 - 75

ROW 26 75 - 80

ROW 27 81 - 89

ROW 28 90 - 96

ROW 29 96 - 102

ROW 30 102 - 104

ROW 31 105 - 109

ROW 32 109 - 114

ROW 33 114 - 119

ROW 34 119 - 122

ROW 35 122 - 127

ROW 36 128 - 134

ROW 37 135 - 139

ROW 38 140 - 148

ROW 39 149 - 156

ROW 40 157 - 164

ROW 41 164 - 171



ROW 42 172 - 179



ROW 43 179 - 182



ROW 44 182 - 188



ROW 45 189 - 192



ROW 46 192 - 196



ROW 47 197 - 203



ROW 48 203 - 208



ROW 49 209 - 213



ROW 50 213 - 217



ROW 51 218 - 223



ROW 52 223 - 228



ROW 53 229 - 235



ROW 54 236 - 241



ROW 55 241 - 247



ROW 56 247 - 254



ROW 57 254 - 259



ROW 58 260 - 260



ROW 59 260 - 262



ROW 60 263 - 269



ROW 61 270 - 276



ROW 62 276 - 278



ROW 63 278 - 286



ROW 64 286 - 289



ROW 65 289 - 291

